

WHAT IS CLAIMED IS:

1. An information receiving/display apparatus configured to receive information for at least one of remotely discernible senses and information for at least one of proximately discernible senses, and display them on an information display plane.

2. The information receiving/display apparatus according to claim 1 wherein said remotely discernible sense is visual sense, auditory sense or olfactory sense.

3. The information receiving/display apparatus according to claim 1 wherein said proximately discernible sense is tactual sense or gustatory sense.

4. The information receiving/display apparatus according to claim 1 wherein said two or more of information for remotely discernible senses and said information for proximately discernible senses are given as functions of positions on said information display plane.

5. The information receiving/display apparatus according to claim 1 wherein information of sound, surface roughness, relative surface temperature or relative surface humidity is represented on said information display plane in addition to image information.

6. The information receiving/display apparatus according to claim 1 wherein said information for at

least one of proximately discernible senses can be obtained from both the front and the back of said information display plane.

7. The information receiving/display apparatus according to claim 1 wherein said information display plane is made of an optical fiber or an optical waveguide having a liquid core, and a fiber having a liquid core.

8. The information receiving/display apparatus according to claim 7 wherein image information is displayed by scattering light introduced into said core from one end or opposite ends of said optical fiber or waveguide by means of light scattering elements in said core at a selected portion in response to an image to be displayed, and thereby leading out it externally.

9. An information receiving/display apparatus configured to receive sensory information other than visual information and audio information, in addition to visual information and/or audio information, and display it on an information display plane.

10. The information receiving/display apparatus according to claim 9 wherein said visual information, said audio information and the other sensory information are given as functions of positions on said information display plane.

11. The information receiving/display apparatus according to claim 9 wherein the other sensory

information is tactual information.

12. The information receiving/display apparatus according to claim 9 wherein the other sensory information is information about relative temperature.

13. The information receiving/display apparatus according to claim 9 wherein the other sensory information is olfactory information.

14. The information receiving/display apparatus according to claim 9 wherein the other sensory information is composed of said image information.

15. The information receiving/display apparatus according to claim 9 wherein the other sensory information is tactual information, and the tactual information is composed of said image information.

16. The information receiving/display apparatus according to claim 9 wherein the other sensory information is information about relative surface temperature or information about relative surface humidity, and the relative surface temperature information or the relative surface humidity information is composed of said image information.

17. The information receiving/display apparatus according to claim 9 wherein said information display plane is made of an optical fiber or an optical waveguide having a liquid core, and a fiber having a liquid core.

18. The information receiving/display apparatus

according to claim 17 wherein image information is displayed by scattering light introduced into said core from one end or opposite ends of said optical fiber or waveguide by means of light scattering elements in said core at a portion selected in response to an image to be displayed, and thereby leading out it externally.

19. An information receiving/display apparatus configured to receive sensory information other than visual information and audio information, in addition to visual information and/or audio information, and display it on an information display plane, wherein said information display plane comprises:

an optical fiber or an optical waveguide having a liquid core for visual information; and

a fiber for information for another sensory information having a liquid core,

image information being displayed by scattering light introduced into said core from one end or opposite ends of said optical fiber or waveguide by means of light scattering elements in said core at a portion selected in response to an image to be displayed, and thereby leading out it externally,

a projection being formed or a temperature change being produced on a surface of said fiber at a portion selected in response to image information to be displayed, and/or, a liquid forming said liquid core or molecules of a substance contained in said liquid being

emanated from a surface of said fiber at a portion selected in response to image information to be displayed.

20. The information receiving/display apparatus according to claim 19 wherein said light scattering elements are bubbles.

21. The information receiving/display apparatus according to claim 20 wherein said bubbles are generated by bringing about cavitation in said liquid forming said liquid core of said optical fiber or optical waveguide.

22. The information receiving/display apparatus according to claim 20 wherein said bubbles are generated by propagating ultrasonic waves from the outer circumferential surface toward the center axis of said optical fiber or optical waveguide.

23. The information receiving/display apparatus according to claim 22 wherein said ultrasonic waves are generated by piezoelectric elements provided on the outer circumferential surface of said optical fiber or optical waveguide.

24. The information receiving/display apparatus according to claim 20 wherein said bubbles can be controlled in size.

25. The information receiving/display apparatus according to claim 20 wherein sizes of said bubbles are distributed substantially symmetrically about the

center axis of said optical fiber or optical waveguide.

26. The information receiving/display apparatus according to claim 19 wherein said light scattering elements are fine particles.

27. The information receiving/display apparatus according to claim 26 wherein said fine particles are controlled in position by propagating ultrasonic waves from the outer circumferential surface toward the center axis of said optical fiber or optical waveguide.

28. The information receiving/display apparatus according to claim 27 wherein said ultrasonic waves are generated by piezoelectric elements provided on the outer circumferential surface of said optical fiber or optical waveguide.

29. The information receiving/display apparatus according to claim 27 wherein said fine particles are controlled in position and/or orientation by introducing an optical field into said optical fiber or optical waveguide from light control elements provided on the outer circumferential surface of said optical fiber or optical waveguide.

30. An information receiving/display apparatus configured to receive visual information and another sensory information other than visual information and audio information, in addition to visual information and/or audio information or in addition to visual information and audio information, and display it on an

information display plane, wherein said information display plane comprises:

a plurality of optical fibers or optical waveguides having liquid cores for visual information;

5 a plurality of fibers for information for another sensory information having liquid cores;

a plurality of first control signal lines for visual information extending across said optical fibers or optical waveguides; and

10 a plurality of second control signal lines for said another sensory information extending across said fibers,

15 first piezoelectric elements being provided on outer circumferential surfaces of said optical fibers or optical waveguides at intersections between said optical fibers or optical waveguides and said first control signal lines,

20 second piezoelectric elements being provided on outer circumferential surfaces of said fibers at intersections between said fibers and said second control signal lines,

25 image information being displayed by scattering light introduced into said cores from one end or opposite ends of selected one of said optical fibers or waveguides selected in response to image information to be displayed, by means of bubbles that are generated by cavitation brought about in a liquid

forming said core by propagating ultrasonic waves from the outer circumferential surface of said optical fiber or optical waveguide by driving said first piezoelectric element at the intersection between selected said optical fiber or optical waveguide and one of said first control signal lines selected in response to said image information to be displayed, and leading out the scattered light externally,

a projection being formed or a temperature change being produced on a surface of one of said fibers selected in response to said image information to be displayed, by propagating ultrasonic waves from the outer circumferential surface of selected said fiber by driving one of said second piezoelectric elements at the intersection between selected said fiber and one of one of said second control signal lines selected in response to said image information to be displayed, and/or, said liquid forming said liquid core or molecules of a substance contained in said liquid being emanated from the surface of one of said fibers selected in response to said image information to be displayed.

31. The information receiving/display apparatus according to claim 30 wherein one of said piezoelectric elements at the intersection between selected said fiber and selected said second control signal line is driven to propagate ultrasonic waves from the outer



circumferential surface of said fiber and thereby bring about cavitation and generate bubbles in said liquid forming said core, such that a projection is made as representation of tactual information on the surface of said fiber due to a pressure of bubbles.

32. The information receiving/display apparatus according to claim 30 wherein one of said piezoelectric elements at the intersection between selected said fiber and selected said second control signal line to propagate ultrasonic waves from the outer circumferential surface of said fiber to increase the temperature of said liquid forming the core as representation of relative surface temperature information.

33. The information receiving/display apparatus according to claim 30 wherein one of said piezoelectric elements at the intersection between selected said fiber and selected said second control signal line to propagate ultrasonic waves from the outer circumferential surface of said fiber to emanate said liquid forming the core or molecules of a substance contained in said liquid as representation of relative surface humidity information or olfactory information.

34. The information receiving/display apparatus according to claim 30 wherein said optical fibers or optical waveguides have light sources at one-side ends or opposite ends thereof.

35. The information receiving/display apparatus according to claim 34 wherein each said light source is a semiconductor laser.

36. The information receiving/display apparatus according to claim said optical fibers or optical waveguides include those for red, those for green and those for blue, said optical fibers or optical waveguides for red having red emitting light sources at one-side ends or opposite ends thereof, said optical fibers or optical waveguides for green having green emitting light sources at one-side ends or opposite ends thereof, and said optical fibers or optical waveguides for blue having blue emitting light sources at one-side ends or opposite ends thereof.

37. The information receiving/display apparatus according to claim 36 wherein said red emitting light sources, said green emitting light sources and said blue emitting light sources are semiconductor lasers.

38. The information receiving/display apparatus according to claim 30 wherein said optical fibers, or optical waveguides, and said fibers are arranged to form a concave plane as a whole.

39. An information receiving/display method characterized in receiving information for at least one of remotely discernible senses and information for at least one of proximately discernible senses, and displaying them on an information display plane.

40. An information receiving/display method characterized in receiving sensory information other than visual information and audio information, in addition to visual information and/or audio information, and displaying it on an information display plane.

41. An information receiving/display method characterized in receiving sensory information other than visual information and audio information, in addition to visual information and/or audio information, and displaying it on an information display plane, wherein said information display plane comprises:

an optical fiber or an optical waveguide having a liquid core for visual information; and a fiber for information for another sensory information having a liquid core,

image information being displayed by scattering light introduced into said core from one end or opposite ends of said optical fiber or waveguide by means of light scattering elements in said core at a portion selected in response to an image to be displayed, and thereby leading out it externally,

a projection being formed or a temperature change being produced on a surface of said fiber at a portion selected in response to image information to be displayed, and/or, a liquid forming said liquid core or

molecules of a substance contained in said liquid being emanated from a surface of said fiber at a portion selected in response to image information to be displayed.

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